# ENGINEERING CHANGE NOTICE



1. ECN 612280

Proj. ECN

| | | | |
|---|---|---|---|
| 2. ECN Category (mark one)<br>Supplemental [X]<br>Direct Revision [ ]<br>Change ECN [ ]<br>Temporary [ ]<br>Standby [ ]<br>Supersedure [ ]<br>Cancel/Void [ ] | 3. Originator's Name, Organization, MSIN, and Telephone No.<br>J. G. Field, LMHC, R2-12, 376-3753 | 4. USQ Required?<br>[] Yes [X] No | 5. Date<br>7/10/97 |
| | 6. Project Title/No./Work Order No.<br>Tank 241-B-112 | 7. Bldg./Sys./Fac. No.<br>NA | 8. Approval Designator<br>NA |
| | 9. Document Numbers Changed by this ECN (includes sheet no. and rev.)<br>WHC-SD-WM-ER-466, Rev. 0B | 10. Related ECN No(s).<br>NA | 11. Related PO No.<br>NA |

| 12a. Modification Work | 12b. Work Package No. | 12c. Modification Work Complete | 12d. Restored to Original Condition (Temp. or Standby ECN only) |
|---|---|---|---|
| [] Yes (fill out Blk. 12b)<br>[X] No (NA Blks. 12b, 12c, 12d) | NA | NA<br>Design Authority/Cog. Engineer Signature & Date | NA<br>Design Authority/Cog. Engineer Signature & Date |

13a. Description of Change

13b. Design Baseline Document? [] Yes [X] No

Add Appendix C, Evaluation to Establish Best-Basis Inventory for Single-Shell Tank 241-B-112.

14a. Justification (mark one)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Criteria Change | [] | Design Improvement | [] | Environmental | [] | Facility Deactivation | [] |
| As-Found | [X] | Facilitate Const | [] | Const. Error/Omission | [] | Design Error/Omission | [] |

14b. Justification Details

An effort is underway to provide waste inventory estimates that will serve as standard characterization source terms for the various waste management activities. As part of this effort, an evaluation of available information for single-shell tank 241-B-112 was performed, and a best-basis inventory was established. This work follows the methodology that was established by the standard inventory task.

15. Distribution (include name, MSIN, and no. of copies)

| | | | |
|---|---|---|---|
| Central Files | A3-88 | K. M. Hall | R2-12 |
| DOE Reading Room | H2-53 | K. M. Hodgson | R2-11 |
| TCSRC | R1-10 | J. M. Conner | R2-11 |
| File | H5-49 | B. A. Higley | H5-27 |
| J. G. Field | R2-12 | L. M. Sasaki | R2-12 |
| M. J. Kupfer | H5-49 | | |
| M. D. LeClair (3) | H0-50 | | |

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| ENGINEERING CHANGE NOTICE | Page 2 of 2 | 1. ECN (use no. from pg. 1) 612280 |
|---|---|---|

| 16. Design Verification Required | 17. Cost Impact | | | | 18. Schedule Impact (days) | |
|---|---|---|---|---|---|---|
| | ENGINEERING | | CONSTRUCTION | | | |
| [] Yes | Additional | [] $ | Additional | [] $ | Improvement | [] |
| [X] No | Savings | [] $ | Savings | [] $ | Delay | [] |

19. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 13. Enter the affected document number in Block 20.

| | | | | | |
|---|---|---|---|---|---|
| SDD/DD | [] | Seismic/Stress Analysis | [] | Tank Calibration Manual | [] |
| Functional Design Criteria | [] | Stress/Design Report | [] | Health Physics Procedure | [] |
| Operating Specification | [] | Interface Control Drawing | [] | Spares Multiple Unit Listing | [] |
| Criticality Specification | [] | Calibration Procedure | [] | Test Procedures/Specification | [] |
| Conceptual Design Report | [] | Installation Procedure | [] | Component Index | [] |
| Equipment Spec. | [] | Maintenance Procedure | [] | ASME Coded Item | [] |
| Const. Spec. | [] | Engineering Procedure | [] | Human Factor Consideration | [] |
| Procurement Spec. | [] | Operating Instruction | [] | Computer Software | [] |
| Vendor Information | [] | Operating Procedure | [] | Electric Circuit Schedule | [] |
| OM Manual | [] | Operational Safety Requirement | [] | ICRS Procedure | [] |
| FSAR/SAR | [] | IEFD Drawing | [] | Process Control Manual/Plan | [] |
| Safety Equipment List | [] | Cell Arrangement Drawing | [] | Process Flow Chart | [] |
| Radiation Work Permit | [] | Essential Material Specification | [] | Purchase Requisition | [] |
| Environmental Impact Statement | [] | Fac. Proc. Samp. Schedule | [] | Tickler File | [] |
| Environmental Report | [] | Inspection Plan | [] | | [] |
| Environmental Permit | [] | Inventory Adjustment Request | [] | | [] |

20. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

| Document Number/Revision | Document Number/Revision | Document Number Revision |
|---|---|---|
| NA | | |

21. Approvals

| | Signature | Date | | Signature | Date |
|---|---|---|---|---|---|
| Design Authority | | | Design Agent | | |
| Cog. Eng. M. J. Kupfer | M J Kupfer | 7-16-97 | PE | | |
| Cog. Mgr. K. M. Hodgson | K. M. Hodgson | 7-15-97 | QA | | |
| QA | | | Safety | | |
| Safety | | | Design | | |
| Environ. | | | Environ. | | |
| Other J. M. Conner | J M Conner | 7-18-97 | Other | | |

DEPARTMENT OF ENERGY

Signature or a Control Number that tracks the Approval Signature

ADDITIONAL

# Tank Characterization Report for Single-Shell Tank 241-B-112

**J. G. Field and B. A. Higley**
Lockheed Martin Hanford Corporation, Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-96RL13200

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Abstract: An effort is underway to provide waste inventory estimates that will serve as standard characterization source terms for the various waste management activities. As part of this effort, an evaluation of available information for single-shell tank 241-B-112 was performed, and a best-basis inventory was established. This work follows the methodology that was established by the standard inventory task.





H W Wickstrand 8/25/97
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# RECORD OF REVISION

| (1) Document Number | Page |
|---|---|
| WHC-SD-WM-ER-466 | ~~A~~ 1 |

(2) Title
Tank Characterization Report for Single-Shell Tank 241-B-112

CHANGE CONTROL RECORD

| (3) Revision | (4) Description of Change - Replace, Add, and Delete Pages | Authorized for Release (5) Cog. Engr. | (6) Cog. Mgr. Date |
|---|---|---|---|
| 0 | (7) Initially released 07/27/95 on EDT-612173. | L.F. Dougherty | J.G. Kristofzski |
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# APPENDIX C

# EVALUATION TO ESTABLISH BEST-BASIS INVENTORY FOR SINGLE-SHELL TANK 241-B-112

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# APPENDIX C

# EVALUATION TO ESTABLISH BEST-BASIS INVENTORY FOR SINGLE-SHELL TANK 241-B-112

An effort is underway to provide waste inventory estimates that will serve as standard characterization source terms for the various waste management activities (Hodgson and LeClair 1996). As part of this effort, an evaluation of available information for single-shell tank 241-B-112 was performed, and a best-basis inventory was established. This work, detailed in the following sections, provides a best-basis inventory estimate for chemical and radionuclide components in tank 241-B-112 and follows the methodology that was established by the standard inventory task.

## C1.0 CHEMICAL INFORMATION SOURCES

Characterization of tank 241-B-112 was conducted to meet the requirements of the *Tank Safety Screening Objective* (Babad and Redus 1994). Consequently, only energetics, criticality (total alpha), and flammability levels in the tank head space have been analyzed. Tank 241-B-112 has not been characterized for chemical or radionuclide composition. Inventory estimates from the Hanford Defined Waste (HDW) model, derived from process flowsheets and waste volume records, are included in (Agnew et al. 1997a).

## C2.0 COMPARISON OF COMPONENT INVENTORY VALUES

Because sample analysis was limited, a sample-based inventory estimate could not be made. The only inventory estimate for tank 241-B-112 is the inventory estimate from the HDW model (Agnew et al. 1997a). This estimate is reported in Tables C2-1 and C2-2. (The chemical species are reported without charge designation per the best-basis inventory convention.) The waste solids volume used to generate the estimate is 125 kL (33 kgal). The HDW model uses a waste density of 1.39 g/mL. Hanlon (1997) classifies all the solids (114 kL [30 kgal]) as sludge and 11 kL (3 kgal) as supernatant. Agnew et al. (1997a) indicates that the solids are 53 kL (14 kgal) of second cycle waste from the bismuth phosphate process generated between 1952 and 1956 (2C2) and 61 kL (16 kgal) of BY salt cake (BYSltCk).

Table C2-1. Hanford Defined Waste Model Inventory Estimates for Nonradioactive Components in Tank 241-B-112.

| Analyte | Hanford Defined Waste model inventory estimate[a] (kg) |
|---|---|
| Al | 3,830 |
| Bi | 468 |
| Ca | 766 |
| Cl | 365 |
| Cr | 219 |
| F | 186 |
| Fe | 2,400 |
| $Fe(CN)_6$ | 0 |
| Hg | 0.458 |
| K | 119 |
| La | 0.0204 |
| Mn | 12.8 |
| Na | 21,600 |
| Ni | 53.7 |
| $NO_2$ | 5,550 |
| $NO_3$ | 28,200 |
| OH | 13,400 |
| Pb | 74.0 |
| $PO_4$ | 1,170 |
| Si | 166 |
| $SO_4$ | 1,460 |
| Sr | 0 |
| TIC as $CO_3$ | 2,910 |
| TOC | 3,010 |
| $U_{TOTAL}$ | 422 |
| Zr | 0.222 |
| $H_2O$ (wt%) | 53.6 |
| Density (kg/L) | 1.39 |

[a]Agnew et al. (1997a).

Table C2-2. Hanford Defined Waste Model Inventory Estimates for Radioactive Components in Tank 241-B-112 (Decayed to January 1, 1994).

| Analyte | Hanford Defined Waste model inventory estimate[a] (Ci) |
|---|---|
| $^{14}C$ | 2.3 |
| $^{90}Sr$ | 8,060 |
| $^{99}Tc$ | 13.6 |
| $^{129}I$ | 0.0263 |
| $^{137}Cs$ | 10,200 |
| $^{154}Eu$ | 36.9 |
| $^{237}Np$ | 0.0456 |
| $^{239/240}Pu$ | 11.2 |
| $^{241}Am$ | 2.96 |

[a]Agnew et al. (1997a).

## C3.0 COMPONENT INVENTORY EVALUATION

The following evaluation of tank contents was performed in order to identify potential errors and/or missing information that could influence the HDW model component inventories.

### C3.1 CONTRIBUTING WASTE TYPES

Tank 241-B-112 was put into service in April 1946, as the third tank in the 241-B-110, 241-B-111, and 241-B-112 cascade. The cascade received 2C waste from B Plant. Tank 241-B-112 was filled in August 1946, and the 2C waste was diverted to the 241-B-104, 241-B-105, and 241-B-106 cascade. The 241-B-110 tank cascade again received 2C waste from B Plant from July 1950, until B Plant was shut down in August 1952. Tank 241-B-112 began overflowing to a crib in the second quarter of 1951 (Agnew et al 1997b).

After B Plant was shut down in June 1952, the 241-B-110 cascade began receiving a concentrated flush waste from B Plant. The flush waste cascaded to tank 241-B-112 in the fourth quarter of 1952. In 1963, tank 241-B-112 began receiving fission product waste from B Plant through tanks 241-B-110 and 241-B-111.

The waste volumes for the tanks in the tank 241-B-110 cascade are shown in Table C3-1 (Hanlon 1997).

Table C3-1. Waste Inventory in the Tanks 241-B-110, 241-B-111, and 241-B-112 Cascade.

| Tank | 241-B-110 | 241-B-111 | 241-B-112 |
|---|---|---|---|
| Sludge volume (kL) | 927 | 893 | 114 |
| Salt cake volume (kL) | 0 | 0 | 0 |
| Supernatant volume (kL) | 4 | 4 | 11 |
| Drainable liquid volume (kL) | 83 | 79 | 0 |

Table C3-2 shows the principal types of solids accumulated in tank 241-B-112 that were reported by various authors. All sources indicate that second cycle bismuth phosphate (2C) waste should be the principal contribution to the waste solids in the tank.

Table C3-2. Expected Solids for Tank 241-B-112.

| Reference | Type |
|---|---|
| Anderson (1990) | 2C, 5-6, FP, FP-EB, EB-IX, EB |
| Sort on Radioactive Waste Type model (Hill et al. 1995) | 2C, 5-6, FP, EB-ITS |
| Waste Status and Transaction Record Summary (Agnew et al. 1997b) | 2C2, BYSltCk |
| Hanford Defined Waste model (Agnew et al. 1997a) | 2C2, BYSltCk |

2C = Second decontamination cycle of the bismuth phosphate process

2C2 = Second decontamination cycle of the bismuth phosphate process generated between 1950 and 1956

5-6 = Cell drainage from bismuth phosphate process

BYSltCk = Saltcake waste generated from in-tank solidification units 1 and 2 between 1965 and 1974.

EB = Evaporator bottoms

EB-ITS = Evaporator bottoms from the in-tank solidification system (BY tank farm)

EB-IX = Evaporator bottoms from ion exchange waste

FP = Fission product waste

FP-EB = Fission product waste from evaporator bottoms.

## C3.2 EVALUATION OF PROCESS FLOWSHEET INFORMATION

Samples from tank 241-B-112 have not been subjected to chemical analysis. However, Agnew et al. (1997b) indicates that essentially all of the waste entering tank 241-B-112 passed through tanks 241-B-110 and 241-B-111. Therefore, the composition of waste in tank 241-B-112 is likely similar to waste in these tanks. Benar et al. (1997) provides a best-basis evaluation of waste in tank 241-B-111.

Tables C3-3 and C3-4 show the sample-based concentrations and average concentration for analytes in tanks 241-B-110 and 241-B-111. Because the waste composition is similar in the first two cascade tanks, the average composition of these tanks provides a reasonable estimate for the composition of tank 241-B-112.

Table C3-3. Nonradioactive Components in Tanks 241-B-110 and 241-B-111. (2 Sheets)

| Analyte | Tank 241-B-110[a] ($\mu$g/g) | Tank 241-B-111[b] ($\mu$g/g) | Average ($\mu$g/g) |
|---|---|---|---|
| Al | 1,130 | 899 | 1,010 |
| Bi | 18,500 | 20,200 | 19,400 |
| Ca | 810 | 689 | 750 |
| Cl | 1,230 | 1,020 | 1,125 |
| Cr | 810 | 1,110 | 960 |
| F | 1,900 | 1,560 | 1,730 |
| Fe | 18,100 | 17,700 | 17,900 |
| K | 312 | NA | 312 |
| La | 31.8 | 7.0 | 19.4 |
| Mn | 66.8 | 79.0 | 72.9 |
| Na | 97,700 | 95,700 | 96,700 |
| Ni | 18.6 | 19.0 | 18.8 |
| $NO_2$ | 10,300 | 45,000 | 27,700 |
| $NO_3$ | 187,000 | 82,000 | 134,500 |
| Pb | NA | 1,570 | 1,570 |
| $PO_4$ | 49,300 | 23,900 | 36,600 |
| Si | 9,360 | 10,400 | 9,880 |
| $SO_4$ | 11,500 | 11,600 | 11,550 |
| Sr | 211 | 218 | 215 |
| TIC as $CO_3$ | 4,500 | 22,300 | 13,400 |

Table C3-3. Nonradioactive Components in Tanks 241-B-110 and 241-B-111. (2 Sheets)

| Analyte | Tank 241-B-110[a] (μg/g) | Tank 241-B-111[b] (μg/g) | Average (μg/g) |
|---|---|---|---|
| TOC | 381 | 875 | 628 |
| $U_{TOTAL}$ | 208 | 197 | 203 |
| Zr | 6.25 | 14.4 | 10.3 |
| $H_2O$ (wt%) | 54.2% | 63.0% | 58.6% |
| Density (kg/L) | 1.35 | 1.19 | 1.27 |

NA = Not analyzed
[a]Kunthara et al. (1997)
[b]Benar et al. (1997).

Table C3-4. Radioactive Components in Tanks 241-B-110 and 241-B-111 (Decayed to January 1, 1994).

| Analyte | Tank 241-B-110[a] (μCi/g) | Tank 241-B-111[b] (μCi/g) | Average (μCi/g) |
|---|---|---|---|
| $^{14}C$ | NA | 0.0016 | 0.0016 |
| $^{90}Sr$ | 98.2 | 231 | 165 |
| $^{99}Tc$ | 0.0165 | 0.114 | 0.0653 |
| $^{129}I$ | 3.60 E-05 | NA | 0.0263 |
| $^{137}Cs$ | 13.6 | 147 | 80.3 |
| $^{154}Eu$ | NA | 0.133 | 36.9 |
| $^{237}Np$ | 1.10 E-04 | 7.14 E-05 | 9.07 E-05 |
| $^{239/240}Pu$ | NA | 0.0973 | 0.0973 |
| $^{241}Am$ | 0.0721 | 0.0842 | 0.0782 |

NA = Not applicable
[a]Kunthara et al. (1997)
[b]Benar et al. (1997).

Tables C3-5 and C3-6 show inventory calculations for tank 241-B-112, based on an average concentration for analytes in tanks 241-B-110 and 241-B-111, a tank volume of 125 kL (Hanlon 1997), and an average waste density of 1.27 g/mL. A comparison between the engineering assessment-based inventory and HDW model inventory is also shown.

Table C3-5. Tank 241-B-112 Inventory for Nonradioactive Components.

| Analyte | Tank 241-B-112 Concentration ($\mu g/g$) | Tank 241-B-112 Estimated Inventory (kg) | HDW model inventory estimate[a] (kg) |
|---|---|---|---|
| Al | 1,010 | 161 | 3,830 |
| Bi | 19,400 | 3,080 | 468 |
| Ca | 750 | 119 | 766 |
| Cl | 1,125 | 179 | 365 |
| Cr | 960 | 153 | 219 |
| F | 1,730 | 275 | 186 |
| Fe | 17,900 | 2,850 | 2,400 |
| K | 312 | 49.6 | 119 |
| La | 19.4 | 3.08 | 0.0204 |
| Mn | 72.9 | 11.6 | 12.8 |
| Na | 96,700 | 15,400 | 21,600 |
| Ni | 18.8 | 2.99 | 53.7 |
| $NO_2$ | 27,700 | 4,400 | 5,550 |
| $NO_3$ | 134,500 | 21,400 | 28,200 |
| Pb | 1,570 | 250 | 74.0 |
| $PO_4$ | 36,600 | 5,800 | 1,170 |
| Si | 9,880 | 1,570 | 166 |
| $SO_4$ | 11,550 | 1,840 | 1,460 |
| Sr | 215 | 34.2 | 0 |
| TIC as $CO_3$ | 13,400 | 2,130 | 2,910 |
| TOC | 628 | 99.9 | 3.01 E+05 |
| $U_{TOTAL}$ | 203 | 32.3 | 422 |
| Zr | 10.3 | 1.64 | 0.222 |
| $H_2O$ (wt%) | 58.6% | 58.6% | 53.6% |
| Density (kg/L) | 1.27 | 1.27 | 1.39 |

HDW = Hanford Defined Waste
[a]Agnew et al. (1997a).

Table C3-6. Tank 241-B-112 Inventory Estimates for Radioactive Components. (Decayed to January 1, 1994)

| Analyte | Tank 241-B-112 Concentration ($\mu$Ci/g) | Tank 241-B-112 Estimated Inventory (Ci) | HDW model inventory estimate[a] (Ci) |
|---|---|---|---|
| $^{14}C$ | 0.0016 | 0.254 | 2.3 |
| $^{90}Sr$ | 165 | 26,200 | 8,060 |
| $^{99}Tc$ | 0.0653 | 10.4 | 13.6 |
| $^{129}I$ | 3.60 E-05 | 0.00572 | 0.0263 |
| $^{137}Cs$ | 80.3 | 12,700 | 10,200 |
| $^{154}Eu$ | 0.133 | 21.1 | 36.9 |
| $^{237}Np$ | 9.07 E-05 | 0.0144 | 0.0456 |
| $^{239/240}Pu$ | 0.0973 | 15.4 | 11.2 |
| $^{241}Am$ | 0.0782 | 12.4 | 2.96 |

HDW = Hanford Defined Waste
[a]Agnew et al. (1997a).

## C3.3 DOCUMENT ELEMENT BASIS

This section compares the engineering assessment-based inventory to the inventory estimate calculated by the HDW model (Agnew et al. 1997a). The HDW model may be biased by the solubility assumptions in the model. The best source of information for all analytes is the engineering estimate, based on tank 241-B-110 and 241-B-111 sample results.

Several significant differences between the engineering assessment inventory and the HDW model inventory are apparent. Al, Bi, Ca, OH, $PO_4$, Si, and U vary by a factor of three or more.

**Aluminum.** The estimates derived from the core samples, and the HDW model estimate for aluminum were 161 kg, and 3,830 kg respectively. Differences are attributed to solubility assumptions in the HDW model.

**Bismuth.** The estimated inventory derived from engineering assessment was 3,080 kg. This compares with 468 kg for the HDW model. Differences are attributed to solubility assumptions in the model.

**Calcium.** The estimated inventory derived from the engineering assessment was 119 kg. This compares with 766 kg estimated by the HDW model.

**Phosphate.** The estimate derived from the engineering assessment and the HDW model estimate for phosphate were 5,800 kg and 1,170 kg respectively. Differences are attributed to solubility assumptions in the HDW model.

**Silicon.** The estimated inventory derived from an engineering assessment was 1,570 kg. This is much higher than the HDW inventory estimate of 166 kg, and is attributed to solubility assumptions in the HDW model.

**Total Hydroxide.** Once the best-basis inventories were determined, the hydroxide inventory was calculated by performing a charge balance with the valences of other analytes. In some cases this approach requires that other analyte (e.g., sodium or nitrate) inventories be adjusted to achieve the charge balance. During such adjustments the number of significant figures is not increased. This charge balance approach was consistent with that used by Agnew et al. (1997a). The calculated total hydroxide inventories based on engineering assessments and HDW model estimates were 661 kg and 13,400 kg, respectively. Most of the difference is attributed to differences in the aluminum inventory estimates for the engineering assessment and HDW model.

**Uranium.** The estimated inventories for an engineering assessment and the HDW model estimate were 32.3 kg and 422 kg respectively. Differences are attributed to solubility assumptions in the HDW model.

## C4.0 DEFINE THE BEST-BASIS AND ESTABLISH COMPONENT INVENTORIES

The best-basis inventory for tank 241-B-112 is derived from the an engineering assessment based on the sample results for tanks 241-B-110 and 241-B-111 for the following reasons:

- Data was not analyzed to calculate a sample-based inventory for tank 241-B-112.
- Tank 241-B-112 should have a waste composition similar to tanks 241-B-110 and 241-B-111 because tank 241-B-112 received the overflow from tank 241-B-111.
- Analytical results from two widely spaced cores samples were used to estimate the component inventories for tanks 241-B-110 and 241-B-111. There is no reason to dispute the analytical results.
- Analytical results for tanks 241-B-110 and 241-B-111 core samples are consistent with receipt of 2C waste.

Tables C4-1 and C4-2 show the best-basis inventory estimates for tank 241-B-112. Engineering-based inventories for each analyte were calculated by multiplying the average concentration and density of analytes in tanks 241-B-110 and 241-B-111 by the volume of waste in tank 241-B-112. The radionuclide inventories shown in Table C4-2 are based on the engineering assessment and the HDW model Rev. 4 estimates (Agnew et al. 1997a) for tank 241-B-112. The inventory values reported in Tables C4-1 and C4-2 are subject to change. Refer to the Tank Characterization Database (TCD) for the most current inventory values.

Best-basis tank inventory values are derived for 46 key radionuclides (as defined in Section 3.1 of Kupfer et al. 1997), all decayed to a common report date of January 1, 1994. Often, waste sample analyses have only reported $^{90}$Sr, $^{137}$Cs, $^{239/240}$Pu, and total uranium (or total beta and total alpha), while other key radionuclides such as $^{60}$Co, $^{99}$Tc, $^{129}$I, $^{154}$Eu, $^{155}$Eu, and $^{241}$Am, etc., have been infrequently reported. For this reason it has been necessary to derive most of the 46 key radionuclides by computer models. These models estimate radionuclide activity in batches of reactor fuel, account for the split of radionuclides to various separations plant waste streams, and track their movement with tank waste transactions. (These computer models are described in Kupfer et al. 1997, Section 6.1 and in Watrous and Wootan 1997.) Model generated values for radionuclides in any of 177 tanks are reported in the HDW Rev. 4 model results (Agnew et al. 1997a). The best-basis value for any one analyte may be either a model result or a sample or engineering assessment-based result if available. (No attempt has been made to ratio or normalize model results for all 46 radionuclides when values for measured radionuclides disagree with the model.) For a discussion of typical error between model derived values and sample derived values (see Kupfer et al. 1997, Section 6.1.10).

Table C4-1. Best-Basis Inventory Estimate for Nonradioactive Components in Tank 241-B-112 (Effective Date May 31, 1997).

| Analyte | Total inventory (kg) | Basis (S, M, E or C)[1] | Comment |
|---|---|---|---|
| Al | 161 | E | |
| Bi | 3,080 | E | |
| Ca | 119 | E | |
| Cl | 179 | E | |
| TIC as $CO_3$ | 2,130 | E | |
| Cr | 153 | E | |
| F | 275 | E | |
| Fe | 2,850 | E | |
| Hg | 0.458 | M | |
| K | 49.6 | E | |
| La | 3.08 | E | |
| Mn | 11.6 | E | |
| Na | 15,400 | E | |
| Ni | 2.99 | E | |
| $NO_2$ | 4,400 | E | |
| $NO_3$ | 21,400 | E | |
| OH | 661 | C | Calculated from a charge balance. |
| Pb | 250 | E | |
| $PO_4$ | 5,800 | E | |
| Si | 1,570 | E | |
| $SO_4$ | 1,840 | E | |
| Sr | 34.2 | E | |
| TOC | 99.9 | E | |
| $U_{TOTAL}$ | 32.3 | E | |
| Zr | 1.64 | E | |

[1]S = Sample-based
M = Hanford Defined Waste model-based
E = Engineering assessment-based
C = Calculated by charge balance; includes oxides as hydroxides, not including $CO_3$, $NO_2$, $NO_3$, $PO_4$, $SO_4$, and $SiO_3$.

Table C4-2. Best-Basis Inventory Estimate for Radioactive Components in Tank 241-B-112 Decayed to January 1, 1994 (Effective May 31, 1997). (2 Sheets)

| Analyte | Total inventory (Ci) | Basis (S, M, E, or C)[1] | Comment |
|---|---|---|---|
| $^{3}H$ | 9.36 | M | |
| $^{14}C$ | 0.254 | E | |
| $^{59}Ni$ | 0.224 | M | |
| $^{60}Co$ | 2.28 | M | |
| $^{63}Ni$ | 22.2 | M | |
| $^{79}Se$ | 0.19 | M | |
| $^{90}Sr$ | 26,200 | E | |
| $^{90}Y$ | 26,200 | E | Referenced to $^{90}Sr$ |
| $^{93m}Nb$ | 0.664 | M | |
| $^{93}Zr$ | 0.92 | M | |
| $^{99}Tc$ | 10.4 | E | |
| $^{106}Ru$ | 4.28 E-04 | M | |
| $^{113m}Cd$ | 4.94 | M | |
| $^{125}Sb$ | 10.2 | M | |
| $^{126}Sn$ | 0.284 | M | |
| $^{129}I$ | 0.00572 | E | |
| $^{134}Cs$ | 0.105 | E | |
| $^{137m}Ba$ | 12,014 | E | Referenced to $^{137}Cs$. |
| $^{137}Cs$ | 12,700 | E | |
| $^{151}Sm$ | 658 | M | |
| $^{152}Eu$ | 0.287 | M | |
| $^{154}Eu$ | 21.1 | E | |
| $^{155}Eu$ | 17.4 | M | |
| $^{226}Ra$ | 8.86 E-06 | M | |
| $^{227}Ac$ | 1.21 E-04 | M | |
| $^{228}Ra$ | 0.109 | M | |
| $^{229}Th$ | 0.00251 | M | |

Table C4-2. Best-Basis Inventory Estimate for Radioactive Components in Tank 241-B-112 Decayed to January 1, 1994 (Effective May 31, 1997). (2 Sheets)

| Analyte | Total inventory (Ci) | Basis (S, M, E, or C)[1] | Comment |
|---|---|---|---|
| $^{231}Pa$ | 6.23 E-04 | M | |
| $^{232}Th$ | 0.00451 | M | |
| $^{232}U$ | 0.586 | M | |
| $^{233}U$ | 2.25 | M | |
| $^{234}U$ | 0.168 | M | |
| $^{235}U$ | 0.00626 | M | |
| $^{236}U$ | 0.00538 | M | |
| $^{237}Np$ | 0.0144 | E | |
| $^{238}Pu$ | 0.19 | M | |
| $^{238}U$ | 0.342 | M | |
| $^{239/240}Pu$ | 15.4 | E | |
| $^{241}Am$ | 12.4 | E | |
| $^{241}Pu$ | 12.7 | M | |
| $^{242}Cm$ | 5.27 E-05 | M | |
| $^{242}Pu$ | 6.10 E-05 | M | |
| $^{243}Am$ | 1.02 E-04 | M | |
| $^{243}Cm$ | 1.08 E-06 | M | |
| $^{244}Cm$ | 1.49 E-05 | M | |

[1]S = Sample-based
M = Hanford Defined Waste model-based
E = Engineering assessment-based
NR = Not reported.

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